Mobile Access To Oncology Knowledge

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Although considerable effort has been put into creating extensive on-line reference resources for oncology, this compiled knowledge is underutilized in clinical situations. The Mobile Access To Oncology Knowledge (MATOK) project facilitates access to a variety of knowledge sources by providing a system designed to be used at the point-of-care. The system's key characteristics are mobility, homogeneous access, concept-based searching, step-wise refinement, and integration with on-line patient data.

Mobility

The time and effort required to gain access to the on-line reference resources is a substantial impediment to their clinical use. The user must locate a free workstation, login, find the right programs, run them, and enter search criteria. Our approach is to use mobile, pen-based computers equipped with short range wireless connection to pre-existing wired networks. The mobile computers use a specialized protocol to communicate with the Knowledge Server (KS) component which contains all of the data sources and executes search requests. The user interface attempts to offer choices from pick-lists in lieu of time-consuming handwriting.

Homogeneous Access

MATOK currently offers access to four reference sources: the CANCERLIT citation database, the Physician's Data Query (PDQ) database, and two oncology textbooks. Finding information in all the sources would require running several different programs and entering the search criteria in several different ways; a time-consuming task. MATOK provides a single user interface to all the sources, and permits switching easily between sources.

Concept-Based Searching

There are substantial variations in terminology across MATOK's sources, such as the use of "breast neoplasm" in CANCERLIT and "breast cancer" in PDQ. To resolve this problem, all of the sources have been analyzed and indexed using an enhanced version of the UMLS Metathesaurus as the source of key concepts and their synonyms and lexical variants. Any words or phrases used in searching the sources are first translated into one of these concepts. Thereafter, any search using that concept will automatically find all variations.

Step-Wise Refinement

MATOK's search interface is designed for use in a busy clinical setting where the goal is to find key information about a topic, not to perform an exhaustive search of the literature. The interface acquires an "anchor" concept from the user and presents a matrix showing how many occurrences (hits) of the concept are contained in each source. Occurrences in "headings" (titles and index terms for citation sources, chapter and section titles in the book-like sources) and occurrences in body text are listed separately to help the user establish how directly the topic is being addressed. If the user adds additional concepts to the search, MATOK updates the count of hits in the selected source to reflect paragraphs where *all* of the concepts appear. Once the user has a set of concepts that result in an appropriate number of hits, the system presents descriptions of the hits (*e.g.*, chapter-section-subsection for books, or title-author-journal for articles), and the associated text can be viewed by tapping. The user can go back to any step with a single tap, and choose another path.

Integration with On-Line Patient Data

Since MATOK is attempting to provide answers to questions that arise in the clinical setting, there is a strong likelihood that the questions will be about something in the patient's record, such as: a diagnosis, problem list entry, or current medication. MATOK has been designed to be called as an adjunct to an electronic medical record (EMR). Ideally, it would be possible to directly indicate an item of interest in the EMR and pass that to MATOK, but that is not practical with many current EMR systems. In our implementation at the NIH Clinical Center we provide access to the HIS on the mobile computer. If MATOK is accessed from within the HIS, the medication list and lab test names for the current patient are passed to MATOK. These names are made available to the user on pick-lists to facilitate establishing search context.

Current Status

MATOK is currently deployed at the Pediatric Oncology Branch of the National Cancer Institute at the NIH Clinical Center in Bethesda, MD. It is being used experimentally by the Pediatric Oncology Fellows and Attending Physicians.

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